**Supplemental Table 1: ICD codes for Immune Checkpoint Inhibitors Associated Cardiotoxicity**

|  |  |  |
| --- | --- | --- |
| **Cardiotoxicity** | **ICD 9 codes** | **ICD 10 codes** |
| Cardiomyopathy | 425.4 Other primary cardiomyopathies 425.8 Cardiomyopathy in other diseases classified elsewhere425.9 Secondary cardiomyopathy, unspecified  | [I42.0](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I42-/I42.0) Dilated cardiomyopathy[I42.5](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I42-/I42.5) Other restrictive cardiomyopathy[I42.7](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I42-/I42.7) Cardiomyopathy due to drug and external agent[I42.8](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I42-/I42.8) Other cardiomyopathies[I42.9](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I42-/I42.9) Cardiomyopathy, unspecified |
| Heart Failure | 428 Heart failure 428.0 Congestive heart failure, unspecified 428.1 Left heart failure 428.2 Systolic heart failure428.20 Systolic heart failure, unspecified 428.21 Acute systolic heart failure 428.22 Chronic systolic heart failure 428.23 Acute on chronic systolic heart failure 428.3 Diastolic heart failure 428.30 Diastolic heart failure, unspecified 428.31 Acute diastolic heart failure 428.32 Chronic diastolic heart failure 428.33 Acute on chronic diastolic heart failure 428.4 Combined systolic and diastolic heart failure 428.40 Combined systolic and diastolic heart failure, unspecified 428.41 Acute combined systolic and diastolic heart failure 428.42 Chronic combined systolic and diastolic heart failure 428.43 Acute on chronic combined systolic and diastolic heart failure428.9 Heart failure, unspecified  | [I50](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50) Heart failure[I50.1](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.1) Left ventricular failure, unspecified[I50.2](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.2) Systolic (congestive) heart failure[I50.20](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.20) Unspecified systolic (congestive) heart failure[I50.21](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.21) Acute systolic (congestive) heart failure[I50.22](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.22) Chronic systolic (congestive) heart failure[I50.23](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.23) Acute on chronic systolic (congestive) heart failure[I50.3](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.3) Diastolic (congestive) heart failure[I50.30](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.30) Unspecified diastolic (congestive) heart failure[I50.31](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.31) Acute diastolic (congestive) heart failure[I50.32](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.32) Chronic diastolic (congestive) heart failure[I50.33](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.33) Acute on chronic diastolic (congestive) heart failure[I50.4](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.4) Combined systolic (congestive) and diastolic (congestive) heart failure[I50.40](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.40) Unspecified combined systolic (congestive) and diastolic (congestive) heart failure[I50.41](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.41) Acute combined systolic (congestive) and diastolic (congestive) heart failure[I50.42](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.42) Chronic combined systolic (congestive) and diastolic (congestive) heart failure[I50.43](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.43) Acute on chronic combined systolic (congestive) and diastolic (congestive) heart failure[I50.8](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.8) Other heart failure[I50.81](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.81) Right heart failure[I50.810](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.810) …… unspecified[I50.811](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.811) Acute right heart failure[I50.812](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.812) Chronic right heart failure[I50.813](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.813) Acute on chronic right heart failure[I50.814](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.814) …… due to left heart failure[I50.82](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.82) Biventricular heart failure[I50.83](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.83) High output heart failure[I50.84](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.84) End stage heart failure[I50.89](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.89) Other heart failure[I50.9](http://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I50-/I50.9) Heart failure, unspecified |
| Myocarditis | 422.0 Acute myocarditis in diseases classified elsewhere | I51.4, Myocarditis, unspecified[I40](https://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I40-/I40) Acute myocarditis[I40.1](https://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I40-/I40.1) Isolated myocarditis[I40.8](https://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I40-/I40.8) Other acute myocarditis[I40.9](https://www.icd10data.com/ICD10CM/Codes/I00-I99/I30-I52/I40-/I40.9) Acute myocarditis, unspecified |
| Arrhythmia | 427 Cardiac dysrhythmias 427.0 Paroxysmal supraventricular tachycardia 427.1 Paroxysmal ventricular tachycardia 427.2 Paroxysmal tachycardia, unspecified 427.3 Atrial fibrillation and flutter 427.31 Atrial fibrillation 427.32 Atrial flutter 427.4 Ventricular fibrillation and flutter 427.41 Ventricular fibrillation 427.42 Ventricular flutter 427.5 Cardiac arrest 427.6 Premature beats 427.60 Premature beats, unspecified 427.61 Supraventricular premature beats 427.69 Other premature beats 427.8 Other specified cardiac dysrhythmias 427.81 Sinoatrial node dysfunction 427.89 Other specified cardiac dysrhythmias 427.9 Cardiac dysrhythmia, unspecified  | I47 Paroxysmal tachycardiaI47.0 Re-entry ventricular arrhythmiaI47.1 Supraventricular tachycardiaI47.2 Ventricular tachycardiaI47.9 Paroxysmal tachycardia, unspecifiedI48 Atrial fibrillation and flutterI48.0 Paroxysmal atrial fibrillationI48.1 Persistent atrial fibrillationI48.2 Chronic atrial fibrillationI48.3 Typical atrial flutterI48.4 Atypical atrial flutterI48.9 Unspecified atrial fibrillation and atrial flutterI48.91 Unspecified atrial fibrillationI48.92 Unspecified atrial flutterI49 Other cardiac arrhythmiasI49.0 Ventricular fibrillation and flutterI49.01 Ventricular fibrillationI49.02 Ventricular flutterI49.1 Atrial premature depolarizationI49.2 Junctional premature depolarizationI49.3 Ventricular premature depolarizationI49.4 Other and unspecified premature depolarizationI49.40 Unspecified premature depolarizationI49.49 Other premature depolarizationI49.5 Sick sinus syndromeI49.8 Other specified cardiac arrhythmiasI49.9 Cardiac arrhythmia, unspecified |
| Pericardial disease | 420 Acute pericarditis 420.0 Acute pericarditis in diseases classified elsewhere420.9 Other and unspecified acute pericarditis 420.90 Acute pericarditis, unspecified 420.91 Acute idiopathic pericarditis 420.99 Other acute pericarditis423 Other diseases of pericardium 423.0 Hemopericardium 423.1 Adhesive pericarditis 423.2 Constrictive pericarditis 423.3 Cardiac tamponade 423.8 Other specified diseases of pericardium 423.9 Unspecified disease of pericardium | I30 Acute pericarditisI30.0 Acute nonspecific idiopathic pericarditisI30.8 Other forms of acute pericarditisI30.9 Acute pericarditis, unspecifiedI31 Other diseases of pericardiumI31.0 Chronic adhesive pericarditisI31.1 Chronic constrictive pericarditisI31.2 Hemopericardium, not elsewhere classifiedI31.3 Pericardial effusion (noninflammatory)I31.4 Cardiac tamponadeI31.8 Other specified diseases of pericardiumI31.9 Disease of pericardium, unspecified |
| Heart Block | 426 Conduction disorders 426.0 Atrioventricular block, complete 426.1 Atrioventricular block other and unspecified 426.10 Atrioventricular block, unspecified 426.11 First degree atrioventricular block 426.12 Mobitz (type) II atrioventricular block 426.13 Other second degree atrioventricular block 426.2 Left bundle branch hemiblock 426.3 Other left bundle branch block 426.4 Right bundle branch block 426.5 Bundle branch block other and unspecified 426.50 Bundle branch block, unspecified 426.51 Right bundle branch block and left posterior fascicular block 426.52 Right bundle branch block and left anterior fascicular block 426.53 Other bilateral bundle branch block 426.54 Trifascicular block 426.6 Other heart block 426.7 Anomalous atrioventricular excitation 426.8 Other specified conduction disorders 426.89 Other specified conduction disorders 426.9 Conduction disorder, unspecified  | I44 Atrioventricular and left bundle-branch blockI44.0 Atrioventricular block, first degreeI44.1 Atrioventricular block, second degreeI44.2 Atrioventricular block, completeI44.3 Other and unspecified atrioventricular blockI44.30 Unspecified atrioventricular blockI44.39 Other atrioventricular blockI44.4 Left anterior fascicular blockI44.5 Left posterior fascicular blockI44.6 Other and unspecified fascicular blockI44.60 Unspecified fascicular blockI44.69 Other fascicular blockI44.7 Left bundle-branch block, unspecifiedI45 Other conduction disordersI45.0 Right fascicular blockI45.1 Other and unspecified right bundle-branch blockI45.10 Unspecified right bundle-branch blockI45.19 Other right bundle-branch blockI45.2 Bifascicular blockI45.3 Trifascicular blockI45.4 Nonspecific intraventricular blockI45.5 Other specified heart blockI45.81 Long QT syndromeI45.89 Other specified conduction disordersI45.9 Conduction disorder, unspecified |

**Supplemental Table 2. Global longitudinal strain and echocardiographic findings of patients with ICI-associated cardiotoxicity**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Patient #** | **Age (yrs)** | **Gender** | **ICI** | **Cardiac event** | **Ejection Fraction (pre)** | **Ejection Fraction (post)** | **GLS (pre)** | **GLS (post)** | **% ∆ GLS**  | **NT pro BNP (post)** | **BNP (post)** |
| 1 | 74 | F | pembrolizumab | Heart failure | 64% | 57% | -15.6 | -14.0 | 11.3 | 320 | -- |
| 2 | 88 | F | pembrolizumab | Heart failure | 62% | 57% | -18.9 | -15.6 | 17.5 | 2,323 | -- |
| 3 | 67 | M | nivolumab | Arrhythmia | 72% | 47% | -19.8 | -11.0 | 44.5 | -- | 314 |
| 4 | 76 | M | pembrolizumab | Heart failure | 52% | 46% | -14.2 | -11.3 | 20.5 | 4,300 | -- |

**ICI: immune checkpoint inhibitor; GLS : global longitudinal strain**